

Career: Fundamental Metal Oxidation Kinetics Visualized by In situ UHV-TEM

Judith C. Yang, University of Pittsburgh, DMR-0134719

GOAL: Understanding oxidation at the nanoscale, by primarily in situ ultra high vacuum transmission electron microscopy (UHV-TEM) for dynamic oxidation kinetics under well-controlled surface conditions.

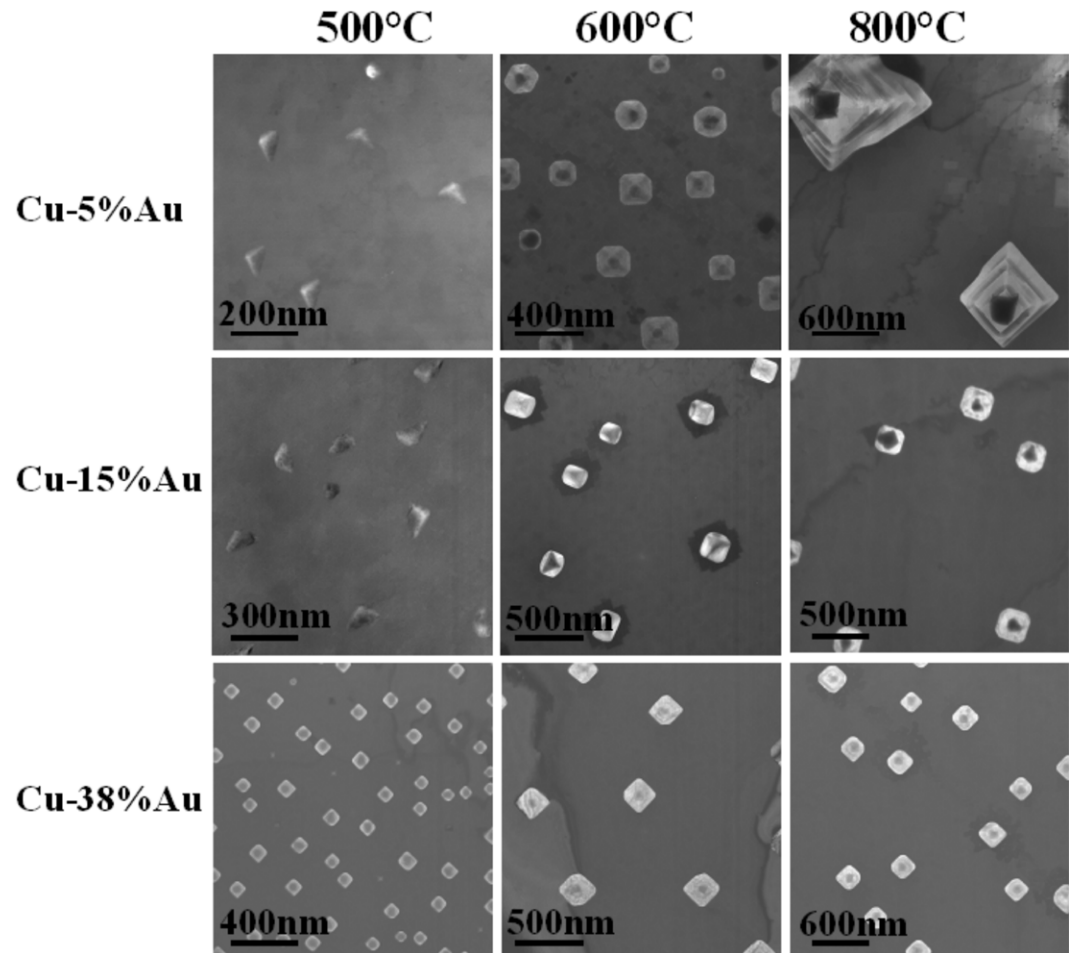
IMPACT

» *environmental stability at the nanoscale, that is essential for the durability of nanodevices.*

» *tailoring of nano-oxidation resistance by alloying.*

» *fuel cells, catalysis, corrosion.*

» *New paradigm for metal oxidation based on "heteroepitaxy" (thin film growth), where surfaces and strain control oxidation mechanisms.*



The effect of Au alloying to Cu oxidation as a function of oxidation temperature. Typical engineering alloys contain more than one element that can dramatically alter oxidation resistance.

Career: Fundamental Metal Oxidation Kinetics Visualized by In situ UHV-TEM

Judith C. Yang, University of Pittsburgh, DMR-0134719

Brief Summary of Outreach

Education:

Undergraduate Students:

Joe Laughlin, Daniel Evan, Lori Tropia, Erin Devlin and Anu Gupta contributed to this research program as summer research experience and/or as senior projects. D. Evan was awarded the ASM award for "Best Senior" in Spring 2003. L. Tropia won 2nd place in the ASM-TMS student poster competition. A journal publication resulted from L. Tropia's and D. Evan's senior projects (Applied Physics Letters, 2002, 81 p.241-3).

A. Gupta is pursuing graduate studies in Materials Science and D. Evan is in the graduate program of Science Education at the University of Pittsburgh. E. Devlin is in the graduate program at the University of Colorado. J. Laughlin won a poster prize at the ASM-TMS student competition in 2004.

Graduate Students:

Guangwen Zhou, Liang Wang (start 8/02) and Li Sun (start 3/04) contributed to this research program. G. Zhou received his PhD in Dec. 2003 and is continuing oxidation studies as a post-doc at Argonne National Laboratory. G. Zhou was the recipient of the 2002 Materials Research Society Silver Graduate Student Award. All extensively use the Materials Research Lab, a user facility, at Univ. of Illinois to broaden their research experience.

Curriculum Development:

A new course, "Thin Films and Characterization", was developed and taught in Fall 2002 for graduate students at the University of Pittsburgh. In 2004, this thin films course will also be offered as a technical elective to undergraduate seniors.